



*YSI incorporated*

# **YSI 550A**

**Handheld  
Dissolved  
Oxygen and  
Temperature  
System**

## **Service Manual**





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## SECTION 1 SERVICE PHILOSOPHY

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The YSI 550A DO Instrument is sold as a complete dissolved oxygen measuring system including an attached probe and a 12, 25, 50 or 100 foot cable. Most service issues that occur in dissolved oxygen systems are caused by improper maintenance of the probe or cable. For this reason, troubleshooting efforts should be initially directed at determining the condition and function of the probe and cable.

In the event that a service problem is isolated to the instrument itself, YSI recommends the replacement of the entire defective sub-assembly rather than individual components. All replacement systems are available through YSI; see **Section 9, Warranty & Repair** for details.

## SECTION 2 PRINCIPLES OF OPERATION

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The sensor consists of a silver body as the anode and a circular gold cathode embedded in the end. In operation, this end of the sensor is filled with a solution of electrolyte containing a small amount of surfactant to improve wetting action.

A thin semi-permeable membrane, stretched over the sensor, isolates the electrodes from the environment, while allowing gases to enter. When a polarizing voltage is applied to the sensor electrodes oxygen that has passed through the membrane reacts at the cathode causing a current to flow.

The membrane passes oxygen at a rate proportional to the pressure difference across it. Since oxygen is rapidly consumed at the cathode, it can be assumed that the oxygen pressure inside the membrane is zero. Hence, the force causing the oxygen to diffuse through the membrane is proportional to the partial pressure of oxygen outside the membrane. As the oxygen partial pressure varies, so does the oxygen diffusion through the membrane. This causes the probe current to change proportionally.

It is important to recognize that oxygen dissolved in the sample is consumed during the test. It is therefore essential that the sample be continuously stirred at the sensor tip. If stagnation occurs, your readings will be artificially low. Stirring may be accomplished by mechanically moving the sample around the probe tip, or by rapidly moving the probe through the sample. The rate of stirring should be at least 0.5 foot per second.

## DISCUSSION OF MEASUREMENT ERRORS

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There are three basic types of dissolved oxygen errors. Type 1 errors are related to limitations of instrument design and tolerances of instrument components. These are primarily the instrument linearity and the resistor tolerances. Type 2 errors are due to basic probe accuracy tolerances, mainly background signal, probe linearity, and variations in membrane temperature coefficient. Type 3 errors are related to the operator's ability to determine the conditions at the time of calibration. If calibration is performed against more accurately known conditions, type 3 errors are appropriately reduced.

## TYPE 1 ERRORS

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- Instrument linearity error:  $\pm 1\%$  of full scale reading, or  $\pm 0.15$  mg/L
- Component and circuitry error:  $\pm 0.05$  mg/L

## TYPE 2 ERRORS

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- DO errors caused by temperature compensation for measurements at  $\pm 10^\circ\text{C}$  from calibration temperature:  $\pm 1\%$  (0.08 mg/L at  $25^\circ\text{C}$ )
- DO errors caused by temperature measurement errors: A maximum  $\pm 0.2^\circ\text{C}$  temperature error is equal to  $\pm 0.5\%$  (0.04mg/L at  $25^\circ\text{C}$ ).

## TYPE 3 ERRORS

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- Altitude
- Operator Error: A 1000 feet error in altitude (when calibrating) is equal to an error of approximately 3.6% at the 10 mg/L level.
- Instrument Error: The maximum DO error caused by calibrating to altitude in increments of 100 feet:  $\pm 0.18\%$  ( $< 0.015$  mg/L at  $25^\circ\text{C}$ )
- Humidity: Errors occur if calibration is performed at less than 100% humidity.

The worst possible case would be calibration at 0% humidity. The error varies with the calibration temperature as follows:

| Temperature | Calibration Error at 0% humidity |
|-------------|----------------------------------|
| 0°C         | 0.09 mg/L                        |
| 10°C        | 0.14 mg/L                        |
| 20°C        | 0.21 mg/L                        |
| 30°C        | 0.33 mg/L                        |
| 40°C        | 0.50 mg/L                        |

## APPROXIMATING THE ERROR

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It is unlikely that the actual error in any measurement will be the maximum possible error. A better error approximation is obtained using a root mean squared (r.m.s.) calculation:

$$\text{r.m.s. error} = \pm [1a^2 + 1b^2 + 2a^2 + 2b^2 + 3a^2 + 3b^2]^{1/2} \text{ mg/L}$$

NOTE: This sample calculation is for a near extreme set of conditions.

## SECTION 3 SPECIFICATIONS

| Display                       | Resolution                             | Range         | Accuracy  |
|-------------------------------|--|---------------|---|
| Dissolved O <sub>2</sub> mg/L | 0.01 mg/L or 0.1 mg/L, user selectable | 0 to 20 mg/L  | ± 0.3 mg/L or ± 2% of reading, whichever is greater   |
|                               |  | 20 to 50 mg/L | ± 6% of reading                                       |
| Dissolved O <sub>2</sub> %    | 0.1% or 1%, user selectable            | 0 to 200%     | ± 2% air sat or ± 2% of reading, whichever is greater |
|                               |  | 200 to 500%   | ± 6% of reading                                       |
| Temperature °C                | 0.1 °C                                 | -5 to +45 °C  | ± 0.3 °C  |
| Temperature °F                | 0.1 °F                                 | 23 to 113 °F  | ± 0.6 °F  |

|  |  |
|--|--|
| <b>Medium:</b>                         | Fresh, sea or polluted water   |
| <b>Dissolved Oxygen Sensor:</b>        | Steady-state polarographic   |
| <b>Dissolved Oxygen Probe:</b>         | Field-replaceable module   |
| <b>Dissolved Oxygen Response Time:</b> | 95% of end value in 9 seconds  |
| <b>Temperature Units:</b>              | Celsius or Fahrenheit, user selectable   |
| <b>Parameter Compensation:</b>         | Automatic temperature compensation for dissolved oxygen<br>Automatic salinity compensation (0-70 ppt) for dissolved oxygen<br>Altitude compensation for dissolved oxygen percent calibration                     |
| <b>Size:</b>                           | 4.7 in. width; 9 in. length (11.9 cm x 22.9 cm)  |
| <b>Weight with Batteries:</b>          | 2 lb. (0.91 kg)  |
| <b>Power:</b>                          | 4 alkaline C-cells   |
| <b>Battery life:</b>                   | Over 2000 hours at 25°C (77°F)   |
| <b>Cables:</b>                         | 12, 25, 50, and 100-foot lengths<br>(3.5, 7.5, 15, 30.5 meter lengths)   |
| <b>Other Features:</b>                 | Waterproof to IP-67<br>High-impact resistance<br>Push-button calibration<br>Built-in calibration chamber<br>Large back-lit display<br>Low battery indicator on display<br>Manual salinity input<br>CE-compliance |

## SECTION 4 PREPARING THE PROBE

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### 4.1 DESCRIPTION

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The YSI 550A dissolved oxygen probe is a replaceable, polarographic sensor designed specifically for the YSI 550A Handheld Dissolved Oxygen System. Probe cables are available in lengths of 12, 25, 50 and 100 feet. See Figure 1.

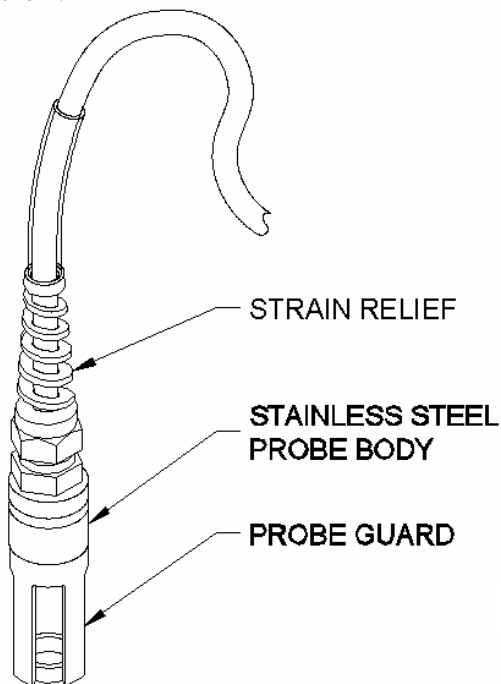


Figure 1

### 4.2 CHOOSING THE RIGHT MEMBRANE

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The YSI 5908 Membrane Kit is supplied with the YSI 550A DO Instrument. This kit contains six cap membranes and a bottle of electrolyte solution. The 5908 Membrane Kit is the **ONLY** kit suitable for the 550A.

### 4.3 PROBE PREPARATION

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The YSI 550A DO probe is shipped dry. **Before using the YSI 550A, the protective membrane cap on the probe tip must be removed, the new membrane cap must be filled with electrolyte solution and installed.** Follow the instructions below to replace the membrane cap.

### 4.4 MEMBRANE CAP INSTALLATION

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To install a new membrane cap on your YSI 550A dissolved oxygen probe:

1. Unscrew and remove the probe sensor guard.
2. Unscrew and remove the old membrane cap.



3. Thoroughly rinse the sensor tip with distilled or DI water.
4. Prepare the electrolyte according to the directions on the KCl solution bottle.
5. Hold the membrane cap and fill it at least 1/2 full with the electrolyte solution.
6. Screw the membrane cap onto the probe moderately tight. A small amount of electrolyte should overflow.
7. Screw the probe sensor guard on moderately tight.

**CAUTION: Do not touch the membrane surface.**

## 4.5 PROBE OPERATION AND PRECAUTIONS

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NOTE: The YSI 550A DO Instrument should not be used in a purpose other than that specified by YSI Incorporated. See **Section 9, Warranty and Repair** for details.

1. It is important to recognize that oxygen dissolved in the sample is consumed during probe operation. It is therefore essential that the sample be continuously stirred at the sensor tip. If stagnation occurs, your readings will be artificially low. Stirring may be accomplished by mechanically moving the sample around the probe tip, or by rapidly moving the probe through the sample. The rate of stirring should be at least .5 foot per second.
2. Membrane life depends on usage. Membranes will last a long time if installed properly and treated with care. Erratic readings are a result of loose, wrinkled, damaged, fouled membranes, or from large (more than 1/8" diameter) bubbles in the electrolyte reservoir. If erratic readings or evidence of membrane damage occurs, you should replace the membrane and the electrolyte solution. The average replacement interval is two to four weeks.
3. If the membrane is coated with oxygen consuming (e.g. bacteria) or oxygen producing organisms (e.g. algae), erroneous readings may occur.
4. Chlorine, sulfur dioxide, nitric oxide, and nitrous oxide can affect readings by behaving like oxygen at the probe. If you suspect erroneous readings, it may be necessary to determine if these gases are the cause.
5. Avoid any environment that contains substances that may attack the probe materials. Some of these substances are concentrated acids, caustics, and strong solvents. The probe materials that come in contact with the sample include PE (Polyethylene), acrylic plastic, EPR rubber, stainless steel, epoxy, polyetherimide and the PVC cable covering.
6. For correct probe operation, the gold cathode must always be bright. If it is tarnished (which can result from contact with certain gases), or plated with silver (which can result from extended use with a loose or wrinkled membrane), the gold surface must be restored. To restore the cathode, you may either return the instrument to the factory or clean it using the sanding disk in the YSI 5238 Probe Reconditioning Kit. Never use chemicals or abrasives not supplied with this kit.

7. It is also possible for the silver anode, which is the entire silver body of the probe, to become contaminated, which will prevent successful calibration. To clean the anode, follow the Anode cleaning instructions in the following section. Next, rinse the sensor tip and Electrolyte reservoir with deionize water, add new Electrolyte solution, and install a new membrane and O-ring. Turn the instrument on and allow the system to stabilize for at least 30 minutes. If, after several hours, you are still unable to calibrate, return the YSI 550A DO Instrument to a YSI authorized service center for service, See **Section 9, Warranty and Repair** for more information.
8. To keep the electrolyte from drying out, store the probe in the calibration/storage chamber with the wet sponge.

## 4.6 PROBE MAINTENANCE

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### ELECTRODE CLEANING

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It is always a good practice to keep the probe in good operating condition.

#### SILVER ANODE

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After extended use, a thick layer of AgCl builds up on the silver anode reducing the sensitivity of the sensor. The anode must be cleaned to remove this layer and restore proper performance. The cleaning can be chemical or mechanical:

- **Chemical cleaning:** Remove the membrane cap and soak the entire anode section in a 14% ammonium hydroxide solution for 2 to 3 minutes, followed by a thorough rinsing with distilled or deionize water. The anode should then be thoroughly wiped with a wet paper towel to remove the residual layer from the anode.
- **Mechanical cleaning:** Sand off the dark layer from the silver anode with 400 grit wet/dry sandpaper. Wrap the wet sandpaper around the anode and twist the probe. Rinse the anode with clean water after sanding, followed by wiping thoroughly with a wet paper towel.

#### GOLD CATHODE

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For correct probe operation, the gold cathode must be textured properly. It can become tarnished or plated with silver after extended use. The gold cathode can be cleaned by using the adhesive backed sanding disc and tool provided in the YSI 5238 Probe Reconditioning Kit.

Using the sanding paper provided in the YSI 5238 Probe Reconditioning Kit, wet sand the gold with a twisting motion about 3 times or until all silver deposits are removed and the gold appears to have a matte finish. If the cathode remains tarnished, return the probe for service. Wipe the gold cathode thoroughly with a wet paper towel before putting on a new membrane cap.

## 4.7 HOW TO REPLACE THE DO PROBE TIP

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The YSI 559 Replaceable DO Module Kit includes:

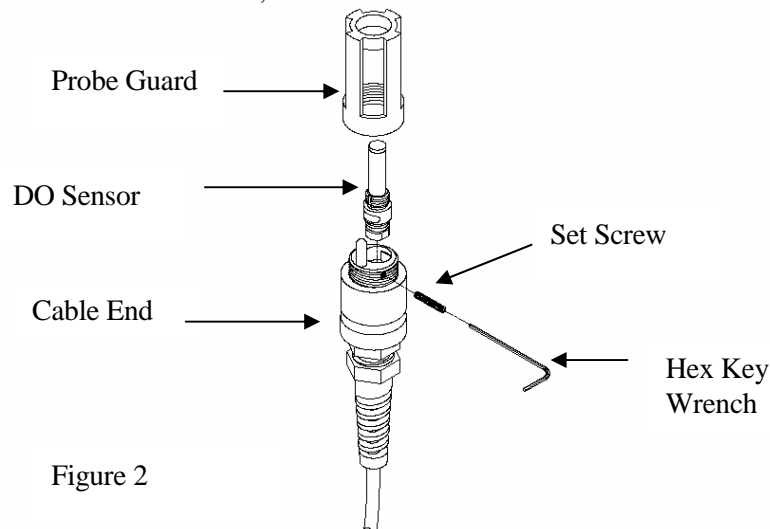
| Quantity | Item                     |
|----------|--------------------------|
| 1        | Instruction Sheet        |
| 1        | Sensor, DO Module        |
| 1        | Set Screw 4-40x 1/2 long |
| 1        | Hex key Wrench, .050"    |

### DO SENSOR REPLACEMENT

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Along with the YSI 559 dissolved oxygen module, YSI supplies a set screw that holds the sensor in place, a hex key wrench to help install the probe, and an instruction sheet. See Figure 6.

1. Remove probe guard.
2. **IMPORTANT:** Thoroughly dry the sensor so that no water enters the probe port when the sensor is removed.
3. Insert the long end of the hex key wrench into the small hole in the side of the DO sensor module (see figure 2). Turn the wrench counter clockwise and remove the screw. (You do not have to remove the screw all the way to release the sensor.)
4. Pull the DO sensor out of the module. The DO sensor is keyed, or has a flat side, so that it can not be removed improperly.
5. Insert the new probe. Make sure that the inside of the module and the o-ring of the sensor are clean, with no contaminants, such as grease, dirt, or hair. The DO sensor is keyed, or has a flat side, so that it can not be installed improperly.
- 6a. **IF you did not remove the screw all the way in Step 3:** Use the hex key wrench to tighten the screw in properly, making sure that the screw does not stick out on either side of the DO sensor module.
- 6b. **IF you removed the screw all the way in Step 3:** Insert the set screw into the small hole in the side of the DO sensor module, and turn clockwise to rethread.



7. The YSI 559 DO module is shipped dry. **Before using the YSI 550A with a new YSI 559 sensor, the protective membrane on the probe tip must be removed, the membrane cap must be filled with electrolyte solution and a new membrane must be installed.** Follow the instructions below to install the electrolyte solution and membrane.

**CAUTION:** Make sure that you do not cross-thread the screw. Use the hex key wrench to tighten the screw in properly, making sure that the screw does not stick out on either side of the cable end. The probe guard will not thread on properly and damage may result if the screw is allowed to stick out on either side of the cable end.

## SECTION 5 CALIBRATION

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Dissolved oxygen calibration must be done in an environment with a known oxygen content. Since the amount of oxygen in the atmosphere is known, it makes an excellent environment for calibration (at 100% relative humidity). The calibration/storage chamber contains a sponge to create a 100% water saturated air environment.

### 5.1 BEFORE YOU CALIBRATE

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Before you calibrate the YSI 550A DO Instrument complete the procedures discussed in **Section 2, Preparing the YSI 550A** and **Section 3, Preparing the Probe**. You can calibrate the YSI 550A DO Instrument in either mg/L or % saturation. In the section below, you will find instructions on how to calibrate and change between these modes.

**Note:** While testing to EN-61000-4-6, Conducted RF Immunity, per Table A.1 of EN61326, Electrical Equipment for Measurement, Control and Laboratory Use, the YSI 550A exhibited an ERROR 8 message from 8.6 MHz 22.8 MHz at induced RF voltages of 3-Volts to 1-Volt RMS on the 25-foot probe cable. If you observe this interference please relocate the probe-cable away from heavy industrial equipment power and control cables or communications equipment cables which may be causing the interference.

To accurately calibrate the YSI 550A, you will need to know the following information:

- The approximate salinity of the water you will be analyzing. Fresh water has a salinity of approximately zero. Seawater has a salinity of approximately 35 parts per thousand (ppt). If you are uncertain what the salinity of the sample water, use a YSI 30 Salinity-Conductivity-Temperature instrument to determine salinity.
- If you are going to calibrate in % saturation mode, you need to know the approximate altitude of the region where you are located.

### 5.2 THE CALIBRATION PROCESS

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1. Ensure that the sponge inside the instrument's calibration chamber is moist. Insert the probe into the calibration chamber.
2. Turn the instrument on by pressing the **ON/OFF** button on the front of the instrument. Wait for the dissolved oxygen and temperature readings to stabilize (usually 15 minutes is required after turning the instrument on).

**Note:** You must choose to calibrate in mg/L or % saturation mode. Once you are in the calibration menu, you can switch between % saturation and mg/L.

To switch between mg/L and % saturation to be displayed as the oxygen readings units, press the Mode key. Either a “mg/L” or “%” will be displayed on the right side of the screen.

3. To enter the calibration menu, use two fingers to press and release both the **UP ARROW** and **DOWN ARROW** keys at the same time.

### TO CALIBRATE IN MG/L:

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Place the probe in solution with a known mg/L reading. You must agitate or stir the probe with a rate of at least .5 foot per second during the entire calibration process.

4. Make sure that the DO reading (large display) is stable, then press the **ENTER** button. The YSI 550A DO instrument should now display **CAL** in the lower left of the display and the current DO reading (before calibration) should be on the main display.
5. Using the up and down arrow keys, select the mg/L value of the known solution, then press the **ENTER** button. The LCD will prompt you to enter the approximate salinity of the water you are about to analyze. You can enter any number from 0 to 70 parts per thousand (PPT) of salinity. Use the arrow keys to increase or decrease the salinity setting. When the correct salinity appears on the LCD (zero for fresh water), press the **ENTER** key. The instrument will return to normal operation.

Once the calibration process is complete, the only keys that will remain operational are the **MODE** key, the **LIGHT** key and the **ON/OFF** key. You can move back and forth from reading dissolved oxygen in the mg/L mode or the % air saturation mode by pressing the **MODE** key. If you are working in a dark area and have difficulty reading the LCD, press the **LIGHT** key to activate the back-light of the YSI 550A. The **ON/OFF** key turns the instrument on or off.

#### For best results:

- Each time the YSI 550A DO Instrument is turned off, re-calibrate before taking measurements.
- Calibrate at a temperature within  $\pm 10^{\circ}\text{C}$  of the sample temperature.

### TO CALIBRATE IN % SATURATION:

---

To switch between mg/L and percent saturation to be displayed as the oxygen readings units, press the Mode key. Either a “mg/L” or “%” will be displayed on the right side of the screen.

4. IF you are calibrating in % saturation mode, the LCD will prompt you to enter the local altitude in hundreds of feet. Use the arrow keys to increase or decrease the altitude.

**EXAMPLE:** Entering the number 12 here indicates 1200 feet.

5. When the proper altitude appears on the LCD, press the **ENTER** key. The YSI 550A DO Instrument should now display **CAL** in the lower left of the display, the calibration value should be displayed in the lower right of the display and the current DO reading (before calibration) should be on the main display.
6. Make sure that the DO reading (large display) is stable, then press the **ENTER** button. The LCD will prompt you to enter the approximate salinity of the water you are about to analyze.

You can enter any number from 0 to 70 parts per thousand (PPT) of salinity. Use the arrow keys to increase or decrease the salinity setting. When the correct salinity appears on the LCD (zero for fresh water), press the **ENTER** key. The instrument will return to normal operation.

Once the calibration process is complete, the only keys that will remain operational are the **MODE** key, the **LIGHT** key and the **ON/OFF** key. You can move back and forth from reading dissolved oxygen in the mg/L mode or the % air saturation mode by pressing the **MODE** key. If you are working in a dark area and have difficulty reading the LCD, press and hold the **LIGHT** key to activate the back-light of the YSI 550A. The **ON/OFF** key turns the instrument on or off.

**For best results:**

Each time the YSI 550A DO Instrument is turned off, re-calibrate before taking measurements.

- Calibrate at a temperature within  $\pm 10^{\circ}\text{C}$  of the sample temperature.

## SECTION 6 TROUBLESHOOTING

**NOTE: An error displayed briefly during the first few seconds after turning the instrument on does NOT indicate a problem.**

| SYMPTOM  | POSSIBLE SOLUTION  |
|--|--|
| 1. Instrument will not turn on, LCD displays "LO BAT", or Main display flashes "OFF" | A. Low battery voltage, replace batteries<br>B. Batteries installed incorrectly, check battery polarity<br>C. Return system for service  |
| 2. Instrument will not calibrate.  | A. Replace membrane and electrolyte<br>B. Clean probe electrodes<br>C. Return system for service   |
| 3. Instrument "locks up".  | A. Remove batteries, wait 15 seconds for reset, replace batteries<br>B. Replace batteries<br>C. Return system for service  |
| 4. Instrument readings are inaccurate.   | A. Verify calibration altitude and salinity settings are correct and recalibrate.<br>B. Probe may not have been in 100% water saturated air during calibration procedure. Moisten sponge in calibration chamber and recalibrate.<br>C. Replace membrane and electrolyte. Recalibrate.<br>D. Clean probe electrodes.<br>E. Return system for service. |
| 5. Main display reads "Over" or "Undr".  | A. Sample O <sub>2</sub> concentration is more than 60 mg/L or 500%, or less than -0.02 mg/L or -0.3%.<br>B. Verify calibration altitude and salinity settings are correct and recalibrate.<br>C. Replace membrane and electrolyte. Recalibrate.<br>D. Clean probe electrodes.<br>E. Return system for service.                                      |
| 6. Main display reads "Over" or "Undr" during calibration.                           | A. Replace membrane and electrolyte. Recalibrate.<br>B. Clean probe electrodes.<br>C. Return system for service.   |
| 7. Secondary display reads "Ovr" or "Undr".  | A. Sample temperature is less than -5° C (23°F) or more than +45° C (122°F). Increase or decrease the sample temperature to bring within the allowable range.<br>B. Return system for service.   |
| 8. Main display reads "Err" and Secondary display reads "RO", "RA", or "AdC".        | A. Return system for service   |
| 9. Main display reads "Err" or burn" and Secondary display reads "EEP"               | A. Return system for service   |



## SECTION 7 DISSASSEMBLY/ASSEMBLY PROCEDURE

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### Tools Required:

- Torque screwdriver , 6.8 in-lbs
- Torque wrench, 12 in-lbs
- Torx T15 bit (long shank)
- Phillips screwdriver

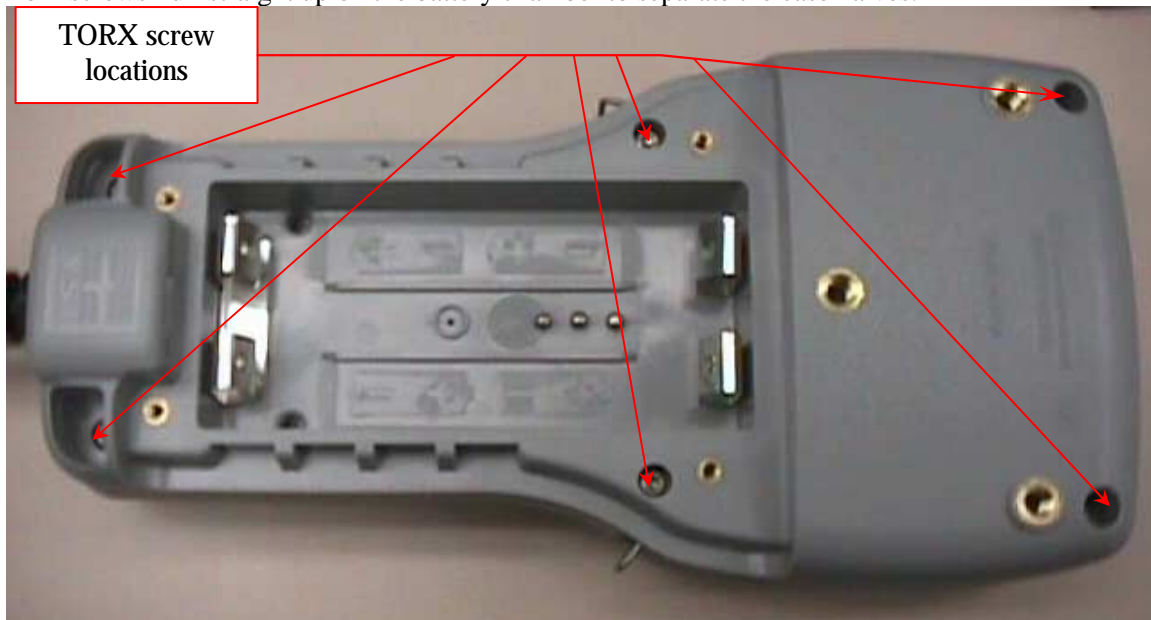
Due to the YSI 550A's waterproof design, it is critical that care be taken during the disassembly and assembly process. Refer to **Section 7.2, Assembly Drawing** while attempting this procedure.

### 7.1 DISSASSEMBLY

---

**Step 1 --** Place the instrument face down on a flat cloth-covered surface. Use a Phillips screwdriver to loosen the 4 battery lid screws. Remove the battery lid and 4 "C" batteries.

**Step 2 --** With the instrument face down on the flat, cloth-covered surface, remove the 6- 6-32 x 1 Torx screws Pull straight up on the battery chamber to separate the case halves.



### PCB REMOVAL

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**Step 1 --** The main PC Board is held in place by a single Phillips screw located in the center of the board. Remove the screw, and gently pull the PC board away from the front case.

**Step 2 --** Carefully slide the probe connectors out of the mating PCB connector. Make note of the



wire color configuration so that the connectors can be correctly re-installed later.

## PROBE CABLE REMOVAL

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**Step 1** -- To separate the probe cable from the front case, unscrew the outer portion of the strain relief (that portion which does not make contact with the case). Slide the spiral portion of the strain relief down the cable toward the probe. Next, unscrew the remaining portion of the strain relief from the front case and pull the wires and connectors through the threaded hole.

## LCD REMOVAL

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**Step 1** -- To separate the LCD assembly from the main PC Board, remove the four Phillips mounting screws.

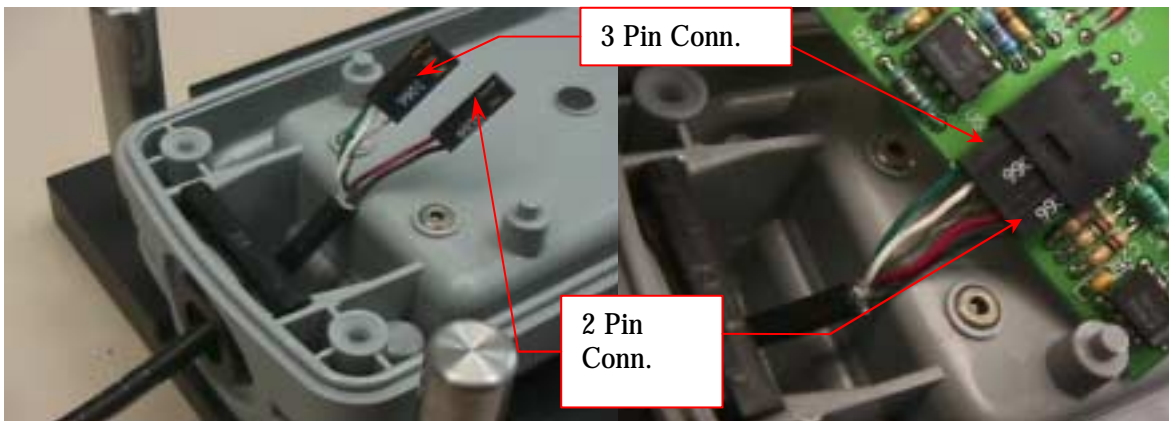
## 7.2 ASSEMBLY

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### PROBE CABLE INSTALLATION

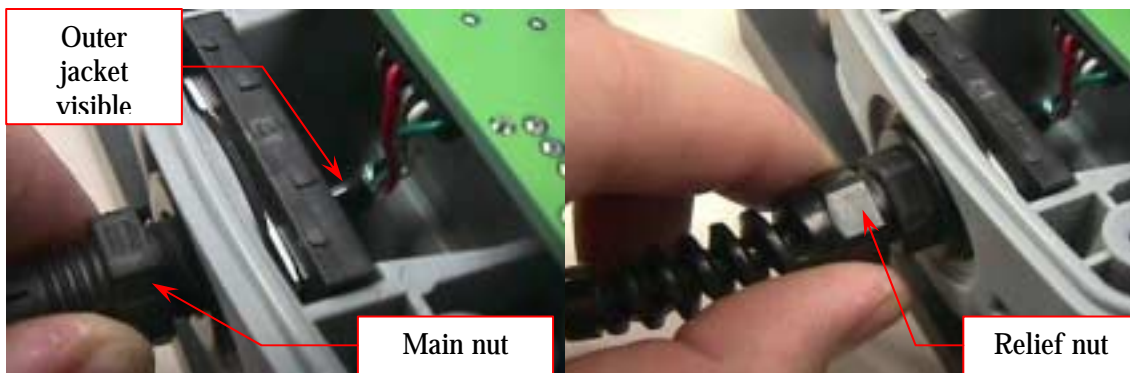
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**Step 1** -- Feed the cable through the threaded hole in the strain relief adapter. Attach the amp connectors of the cable to the 550A Board Assembly. Double check the wire colors. Be sure the connectors are completely installed (they should not stick out past the PCB edge).



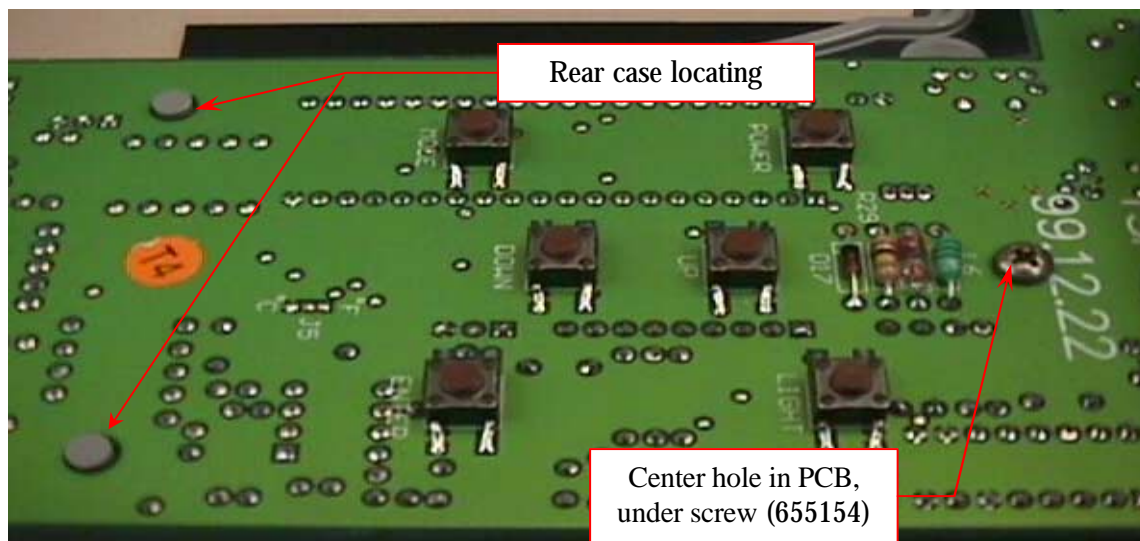
**Step 2** -- Hold the cable so that its outer jacket is visible inside the case. Thread the strain relief main nut into the adapter. Hand-tighten, then torque to 12 in – lbs.

**Step 3** -- Hold the cable with one hand. Use the other hand to thread the relief nut onto the back of the main nut. Hand-tighten, then torque to 12 in - lbs.



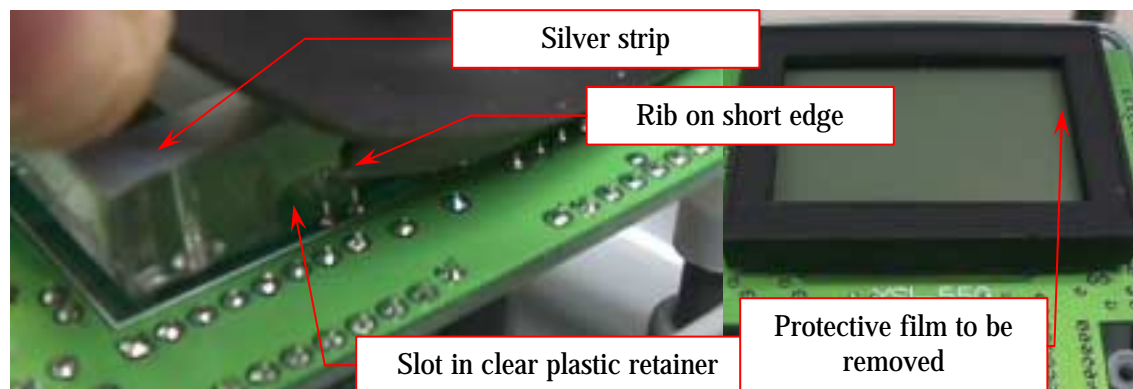
## PCB REPLACEMENT/INSTALLATION

**Step 1 --** Position the PCB onto the rear case locating posts. The case center-mounting hole should be visible through the center hole in the PCB. Fasten the PCB to the case using screw (655154).



**Step 2 --** Remove the protective film from the PCB display and discard.

**Step 3 --** Install the display shock mount onto the PCB display. Locate the ribs on the under side of the shock mount, one on each short edge. Be sure the ribs engage the slots on either side of the clear plastic display retainer.

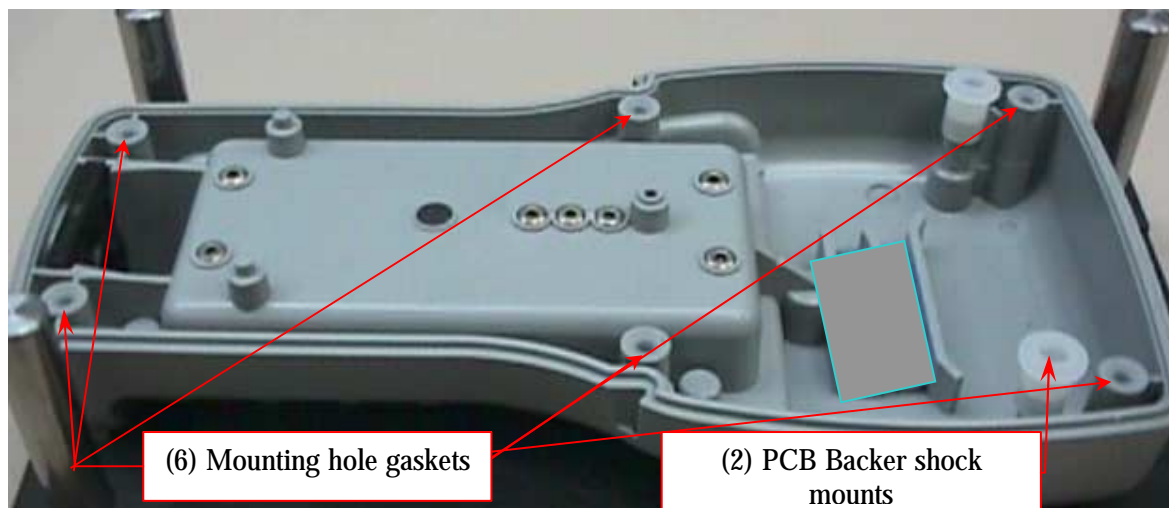


## CASE ASSEMBLY

**!** Whenever the YSI 550A's case is opened; 1) All gaskets and seals need to be clean and free of dirt or dust. 2) Proper torque specs must be followed to ensure a watertight seal.

**Step 1 --** Verify that the (6ea) Mounting hole gaskets and (2ea ) PCB Backer shock mounts are in place.

**Step 2 --** Inspect the lens on the front cover, display lens and gaskets and be certain they are free from dust or lint.



**!** Be sure all gaskets are clean before proceeding. Debris on the gaskets could cause the case to leak.

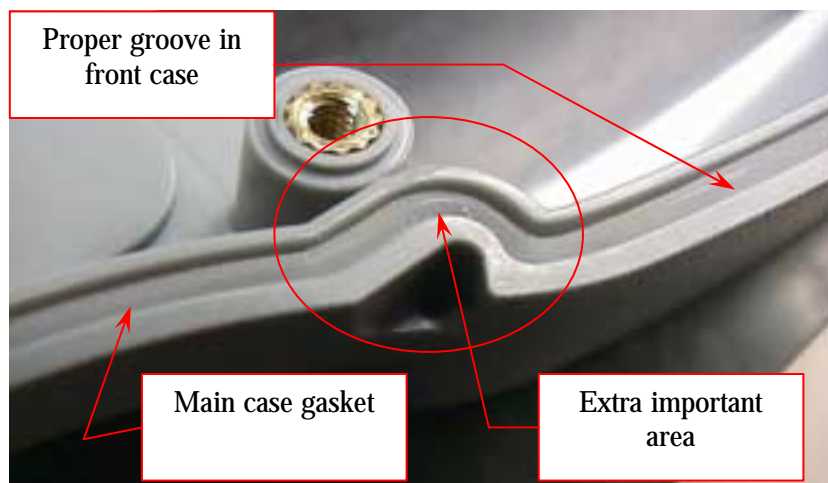
**Step 3 --** Double-check the main case gasket for proper seating and then mate the rear case assembly to the front case. You will need to locate the bails in the proper holes on the rear case as you mate the cases.

Shock mount installs with its lip at the top

Mounting hole gasket installs with its lip at the

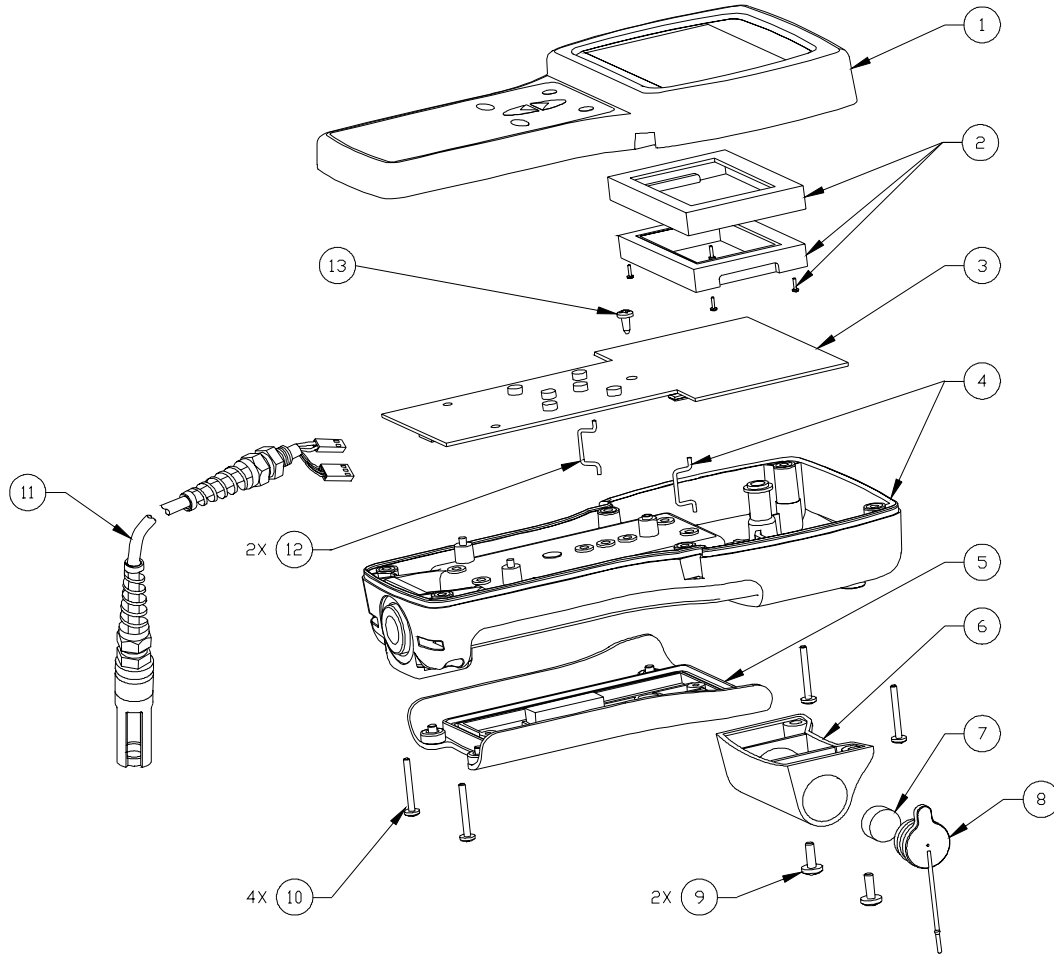


**Step 4** -- Fasten the case halves together using (6ea) Torx screws and torque screw driver set to 6.8 in – lbs.



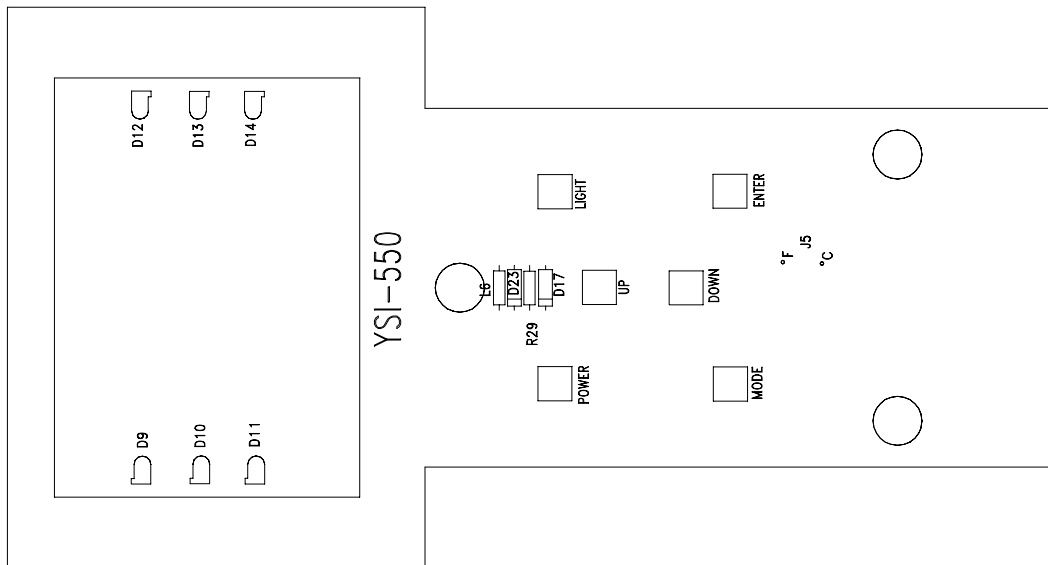
**Step 5** -- Install new warranty protection label

## 7.3 ASSEMBLY DRAWING

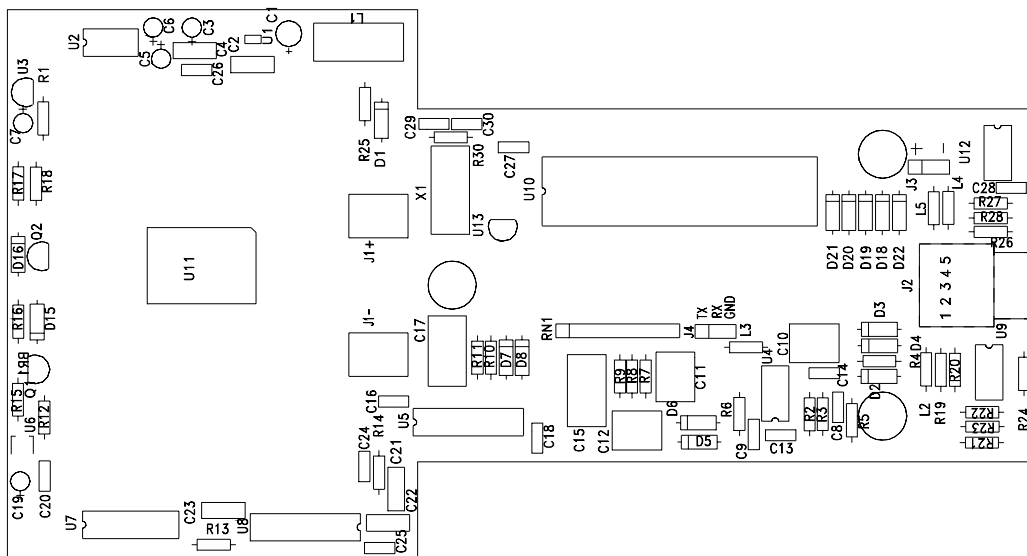


| Bubble Number | Item Number | Description                            |
|---------------|-------------|--|
| 1             | 115525      | Front Cover Assembly W/Keypad          |
| 2             | 115524      | Display Parts Kit                      |
| 3             | 605351      | PC Board Assembly W/Display            |
| 4             | 115521      | Rear Case Assembly                     |
| 5             | 115523      | Battery Lid Assembly W/Screws          |
| 6             | 655148      | Probe Storage Chamber                  |
| 7             | 055219      | Sponge                                 |
| 8             | 655157      | Rubber Plug                            |
| 9             | 655155      | (2) ¼-20 Phillips Round Machine Screws |
| 10            | 655152      | (6) 6-32 x 1 Lg Pan Head Torx Screws   |
| 11            | 115158      | Cable assembly, 12 ft                  |
| 11            | 115159      | Cable assembly, 25 ft                  |
| 11            | 115160      | Cable assembly, 50 ft                  |
| 11            | 115161      | Cable assembly, 100 ft                 |
| 12            | 655137      | Handstrap Bail                         |
| 13            | 655154      | 4-20 x ¼ Lg PCB Screw                  |

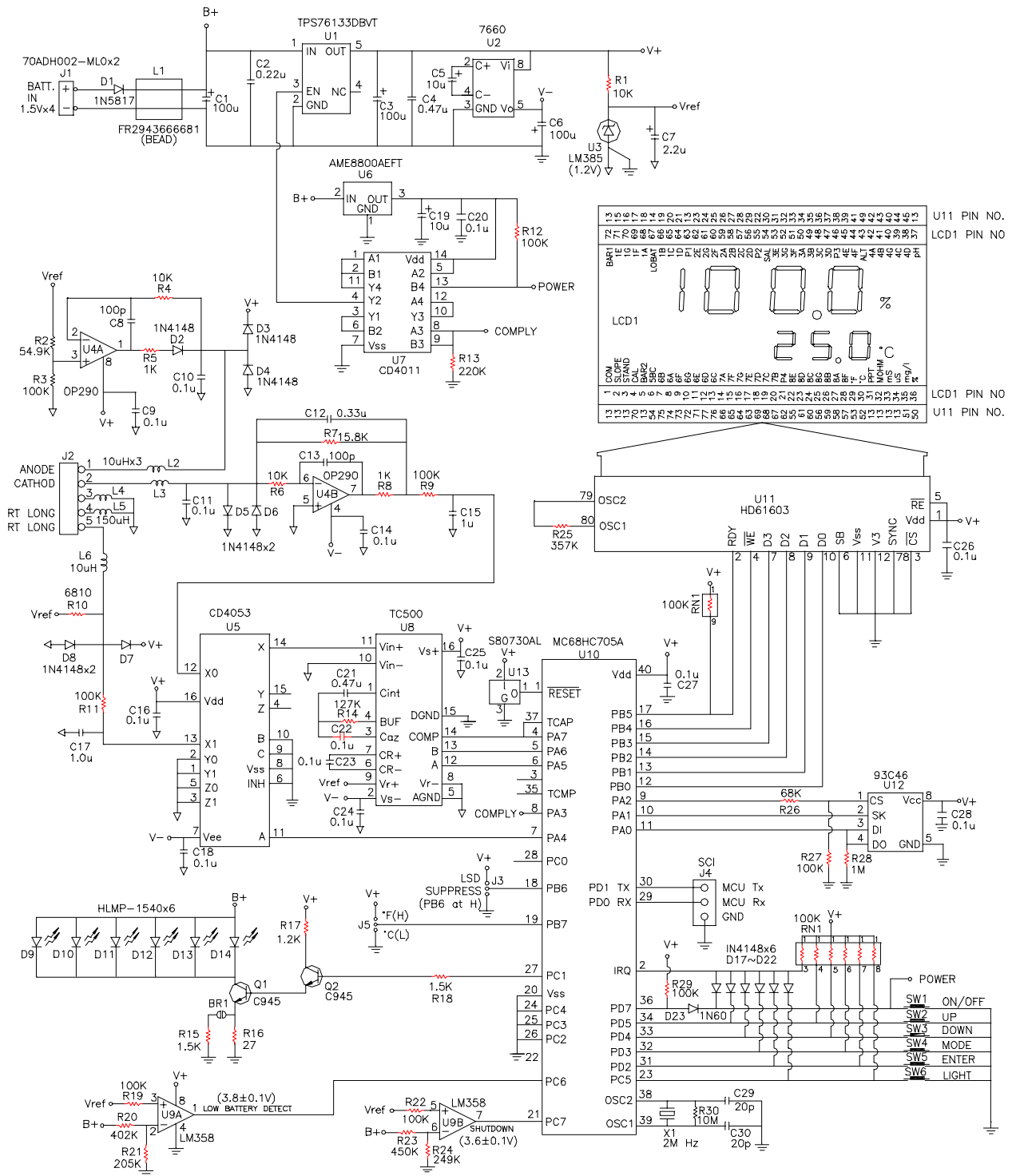
FRONT



## REAR









## 7.6 CIRCUIT BOARD PARTS LIST

| CIRCUIT SYMBOL             | DESCRIPTION              | QTY. |
|----------------------------|--------------------------|------|
| J1+,J1-                    | CONN. 70ADH002-ML0       | 2    |
| J2                         | CONN. 5 PIN. RT. ANGLE   | 1    |
| J3,J4                      | CONN. 3 PIN. RT. ANGLE   | 0.2  |
| R1                         | RES. 10K,5%,1/4W         | 1    |
| R2                         | RES. 54.9K,1%,1/4W       | 1    |
| R3                         | RES. 100K,1%,1/4W        | 1    |
| R4,R6                      | RES. 10K,1%,1/4W         | 2    |
| R5,R8                      | RES. 1K,1%,1/4W          | 2    |
| R7                         | RES. 15.8K,1%,1/4W       | 1    |
| R9,R11,R12,R19,R22,R27,R29 | RES. 100K,5%,1/4W        | 7    |
| R10                        | RES. 6.81K,0.1%,1/4W     | 1    |
| R13                        | RES. 220K,5%,1/4W        | 1    |
| R14                        | RES. 127K,1%,1/4W        | 1    |
| R15,R18                    | RES. 1.5K,5%,1/4W        | 2    |
| R16                        | RES. 27,5%,1/4W          | 1    |
| R17                        | RES. 1.2K,5%,1/4W        | 1    |
| R20                        | RES. 402K,1%,1/4W        | 1    |
| R21                        | RES. 205K,1%,1/4W        | 1    |
| R23                        | RES. 450K,1%,1/4W        | 1    |
| R24                        | RES. 249K,1%,1/4W        | 1    |
| R25                        | RES. 357K,1%,1/4W        | 1    |
| R26                        | RES. 68K,5%,1/4W         | 1    |
| R28                        | RES. 1M,5%,1/4W          | 1    |
| R30                        | RES. 10M,5%,1/4W         | 1    |
| RN1                        | RES. SIP. 100K           | 1    |
| L1                         | BEAD FR2943666681        | 1    |
| L2,L3,L4,L6                | INDUCTOR. 10uH,1/4W      | 4    |
| L5                         | INDUCTOR. 150uH,1/4W     | 1    |
| C1,C3,C6                   | CAPR. ELE. 100uF,16V     | 3    |
| C2,C10,C11,C22,C23         | CAPR. MPE. 0.1uF,63V     | 5    |
| C4,C21                     | CAPR. MPE. 0.47uF,63V    | 2    |
| C5,C19                     | CAPR. ELE. 10uF,16V      | 2    |
| C7                         | CAPR. ELE. 2.2uF,16V     | 1    |
| C8,C13                     | CAPR. CER. 100pF,50V     | 2    |
| C9,C14,C16,C18,C20,C24~C28 | CAPR. MULTI. 0.1uF,50V   | 10   |
| C12                        | CAPR. MPE. 0.33uF,63V    | 1    |
| C15,C17                    | CAPR. MPE. 1uF,63V       | 2    |
| C29,C30                    | CAPR. CER. 20pF,50V      | 2    |
| X1                         | CRYSTAL 2.000M Hz        | 1    |
| Q1,Q2                      | TRSTR. C945P             | 1    |
| U1                         | I.C. TI TPS76133DBVT     | 1    |
| U2                         | I.C. TLDN. TSC7660CPA    | 1    |
| U3                         | I.C. NATL LM385-1.2      | 1    |
| U4                         | I.C. AMP OP290GP         | 1    |
| U5                         | I.C. NATL. CD4053BCN     | 1    |
| U6                         | I.C. AME AME8800AEFT     | 1    |
| U7                         | I.C. TOSH. TC4011BP      | 1    |
| U8                         | I.C. TLDN. TSC500CPE     | 1    |
| U9                         | I.C. NATL. LM358N        | 1    |
| U10                        | I.C.MOTOR.MC68HC705C8ACP | 1    |
| U11                        | I.C. OKI M5265 0082352-B | 1    |
| U12                        | I.C. EXCL. XLS93C46P     | 1    |
| U13                        | I.C. SEIKO. S80730AL     | 1    |
| SW1~SW6                    | TACT SW. KDTSM62N-GS     | 6    |
| D1                         | DIODE, 1N5817            | 1    |
| D2~D8,D17~D22              | DIODE, 1N4148            | 13   |
| D9~D14                     | LED LAMP,HLMP-1540       | 6    |
| D23                        | DIODE, 1N60              | 1    |

## SECTION 8 TEST PROCEDURES

### 8.1 SYSTEM FUNCTIONALITY TEST

The Model 550A can be easily tested using the **DO4 Test Box** or resistance decade boxes. If a test box isn't available, the following quick test can be used to verify the system's operation.

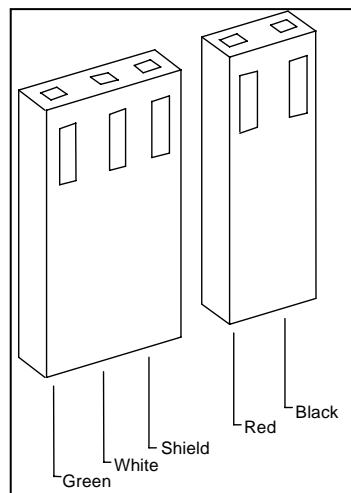
1. If necessary, service the probe's electrodes.
2. Install a fresh membrane and probe solution. Place the probe in its calibration chamber.
3. Turn the system on and allow it to stabilize for 15-30 minutes.
4. Calibrate the system as described in the **Calibration** section of this manual.
5. With the probe in the calibration chamber, check the displayed reading for stability. Erratic or drifting readings indicate a possible problem. See the **Troubleshooting** section for help.
6. Place the probe in a zero oxygen environment. The display should decrease rapidly and reach  $0 \pm 2\%$  in 5 minutes or less.

A zero oxygen environment can be obtained by taking a reading in pure nitrogen gas or in a sodium sulfite solution. It can also be obtained in a BOD bottle filled with 350 mL of distilled water in which 3 to 7 grams of active dry yeast has been dissolved and allowed to consume the oxygen (about 5 minutes).

### 8.2 PROBE TEST

The probe thermistor can be tested by measuring its resistance in a temperature controlled bath and comparing the reading to the chart below. With the probe disconnected from the instrument, connect a precision ohm meter to the **Red** and **Black** probe wires. **All readings are  $\pm 10$  ohms.**

| Bath temperature<br>Celsius | Resistance in<br>Ohms |
|-----------------------------|-----------------------|
| 0                           | 32.66 K               |
| 10                          | 19.90 K               |
| 25                          | 10.00 K               |
| 40                          | 5329.0                |



Electrical leakage between the sensor electrodes and/or the thermistor can cause system failure. Before using the test below, remove the probe's membrane and rinse the electrodes with distilled water. Then, thoroughly dry the sensor end with compressed air or a soft towel.

| Ohm Meter Lead #1    | Ohm Meter Lead #2    | Resistance Reading     |
|----------------------|----------------------|------------------------|
| Green (silver anode) | White (gold cathode) | 200 meg ohm or greater |

|                      |                            |                        |
|----------------------|----------------------------|------------------------|
| Green (silver anode) | Red (thermistor)           | 200 meg ohm or greater |
| White (gold cathode) | Red (thermistor)           | 200 meg ohm or greater |
| Green, White, Red    | Stainless steel probe body | 200 meg ohm or greater |

## 8.3 TEST PROCEDURES

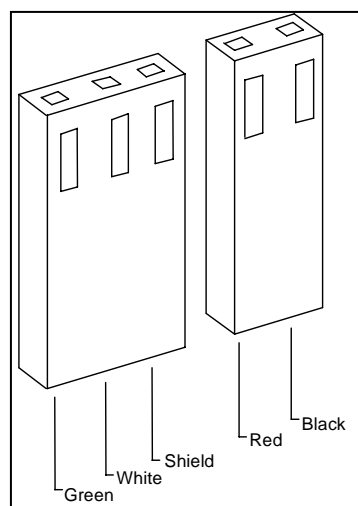
As stated in the *Service Philosophy* section of this manual, the best way to troubleshoot the Model 550A is by subassembly substitution. Below are procedures to test the accuracy and function of the instrument's circuits. If any section of the test fails, the board assembly or probe will have to be repaired or replaced.

### TEMPERATURE CIRCUIT TEST

Disassemble the instrument case by following the *Disassembly Procedure* section of this manual.

The temperature circuit can be tested by substituting the probe thermistor at connector J2, pins 4 and 5 with a decade resistance box or by using the DO4 test box (Sub for **Red** and **Black** probe wires).

| Resistance Input<br>J2 Pins 4 & 5 | Acceptable<br>Displayed Reading |
|-----------------------------------|---------------------------------|
| 32.66 K $\Omega$ $\pm$ .1%        | 0.0 °C $\pm$ .1 °C              |
| 19.90 K $\Omega$ $\pm$ .1%        | 10.0 °C $\pm$ .1 °C             |
| 10.00 K $\Omega$ $\pm$ .1%        | 25.0 °C $\pm$ .1 °C             |
| 5329 $\Omega$ $\pm$ .1%           | 40.0 °C $\pm$ .1 °C             |



### DISSOLVED OXYGEN CIRCUIT TEST

Perform this test using a DO4 Test Box, or by using a decade resistance box connected to J2 pins 1 & 2 (Sub for Green and White probe wires) and input the resistance values in column 2. To begin the test, input the resistance value (in chart above) for 25.0 °C and input the resistance of Row #1. Calibrate to 100.0 %, Salinity set to 0.0 ppt.

NOTE: Last setting is with a temperature resistance value of 10.0 °C.

| Input to connector J2, Pins 1 & 2 |                              |                             |                                |
|-----------------------------------|------------------------------|-----------------------------|--------------------------------|
| Set temperature<br>to report:     | Resistor input:              | Display Reading<br>(% Mode) | Display Reading<br>(Mg/L Mode) |
| 25.0 °C                           | 111.42 K $\Omega$ $\pm$ 0.1% | 100.0 $\pm$ 0.1%            | 8.26 $\pm$ 0.02 Mg/L           |
| 25.0 °C                           | 250.0 K $\Omega$ $\pm$ 0.1%  | 44.6 $\pm$ 0.2%             | 3.68 $\pm$ 0.02 Mg/L           |
| 25.0 °C                           | 2.04 M $\Omega$ $\pm$ 1%     | 5.5 $\pm$ 0.2%              | 0.45 $\pm$ 0.02 Mg/L           |
| 25.0 °C                           | Infinity                     | 0.0 $\pm$ 1.0%              | 0.00 $\pm$ 0.1 Mg/L            |
| 10.0 °C                           | 88.2 K $\Omega$ $\pm$ 0.1%   | 296.4 $\pm$ 0.2%            | 33.46 $\pm$ 0.02 Mg/L          |

## SECTION 9 WARRANTY AND REPAIR

---

The YSI 550A DO Instrument is warranted for three years from date of purchase by the end user against defects in materials and workmanship. YSI 550A DO probes and cables are warranted for one year from date of purchase by the end user against defects in material and workmanship. Within the warranty period, YSI will repair or replace, at its sole discretion, free of charge, any product that YSI determines to be covered by this warranty.

To exercise this warranty, write or call your local YSI representative, or contact YSI Customer Service in Yellow Springs, Ohio. Send the product and proof of purchase, transportation prepaid, to the Authorized Service Center selected by YSI. Repair or replacement will be made and the product returned transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days from date of repair or replacement.

### **Limitation of Warranty**

This Warranty does not apply to any YSI product damage or failure caused by (i) failure to install, operate or use the product in accordance with YSI's written instructions, (ii) abuse or misuse of the product, (iii) failure to maintain the product in accordance with YSI's written instructions or standard industry procedure, (iv) any improper repairs to the product, (v) use by you of defective or improper components or parts in servicing or repairing the product, or (vi) modification of the product in any way not expressly authorized by YSI.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. YSI's LIABILITY UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AND THIS SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY. IN NO EVENT SHALL YSI BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY.

## AUTHORIZED U.S. SERVICE CENTERS

---

### North Region

YSI Incorporated • Repair Center • 1725 Brannum Lane • Yellow Springs, Ohio • 45387  
• Phone: (800) 765-4974 • (937) 767-7241 • E-Mail: [info@ysi.com](mailto:info@ysi.com)

### Central Region

Geotech Environmental Equipment, Inc. • 8035 East 40<sup>th</sup> Ave • Denver, CO • 80207 •  
Phone: (303) 320-4764 • Fax: (303) 322-7242

### South Region

YSI Environmental, Inc. • 12231 Industriplex Blvd • Suite A • Baton Rouge, LA • 70809  
Phone: (866) 216-2662 • (225) 753-2650 • Fax: (225) 753-8669

### West Region

EQUIPCO Sales and Service • 2100 Meridian Park Blvd. • Concord, CA • 94520 • Phone:  
(800)550-5875 • Fax: (510)674-8655



## INTERNATIONAL AUTHORIZED SERVICE CENTERS

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YSI Incorporated • Repair Center • 1725 Brannum Lane • Yellow Springs, Ohio • 45387  
• Phone: (937) 767-7241 • E-Mail: info@ysi.com

Hoskin Scientific Ltd. • 4210 Morris Drive • Burlington, ONT., L7L 5L6 • Canada •  
Ph: 905-333-5510 • Fax: 905-333-4976 • www.hoskin.ca

Hydrodata Services • Unit 8, Business Centre West, Avenue One • Letchworth • Herts •  
SG6 2HB • United Kingdom • Phone: (44-1462) 673581 • Fax: (44-1462) 673582

YSI/Nanotech • Kaizuka 1-15-4 • Kawasaki-Ku, Kawasaki City, Japan • 210-0014 •  
Phone: (81-4) 4 3222-0009 • Fax: (81-3) 4 4221-1102 • Email: Nanotech@ysi.com

## SPECIALTY AUTHORIZED SERVICE CENTERS

---

### **Aquaculture**

Aquatic Eco Systems, Inc. • 1767 Benbow Court • Apopka, Florida • Phone: (407) 886-3939 • Fax: (407) 886-6787

Aquacenter • 166 Seven Oaks Road • Leland, Mississippi • 38756 • Phone: (601) 378-2861 • Fax: (601) 378-2862

### **Wastewater**

Q.C. Services • P.O. Box 68 • Harrison, Maine • 04040 • Phone: (207) 583-2980

Q.C. Services • P.O. Box 14831 • Portland, Oregon • 97293 • Phone: (503) 236-2712

North Central Labs • 400 Lyons Road • Birnamwood, Wisconsin • Phone: (800) 648-7836  
• Fax: (715) 449-2454

C B & S • P.O. Box 556 • Sycamore, Illinois • 60178 • Phone: (815) 895-5158  
Fax: (815) 895-8034

## CLEANING INSTRUCTIONS

---

**NOTE: Before being returned for service, equipment exposed to biological, radioactive, or toxic materials must be cleaned and disinfected.** Biological contamination is presumed for any instrument, probe, or other device that has been used with body fluids or tissues, or with waste water. Radioactive contamination is presumed for any instrument, probe or other device that has been used near any radioactive source.

If an instrument, probe, or other part is returned or presented for service without a Cleaning Certificate, and if in our opinion it represents a potential biological or radioactive hazard, our service personnel reserve the right to withhold service until appropriate cleaning, decontamination, and certification has been completed. We will contact the sender for instructions as to the disposition of the equipment. Disposition costs will be the responsibility of the sender.

When service is required, either at the user's facility or at YSI, the following steps must be taken to insure the safety of our service personnel.

1. In a manner appropriate to each device, decontaminate all exposed surfaces, including any containers. 70% isopropyl alcohol or a solution of 1/4 cup bleach to 1 gallon tap water are suitable for most disinfecting. Instruments used with wastewater may be disinfected with .5% Lysol if this is more convenient to the user.
2. The user shall take normal precautions to prevent radioactive contamination and must use appropriate decontamination procedures should exposure occur.
3. If exposure has occurred, the customer must certify that decontamination has been accomplished and that no radioactivity is detectable by survey equipment.
4. Any product being returned to the YSI Repair Center, should be packed securely to prevent damage.
5. Cleaning must be completed and certified on any product before returning it to YSI.

## PACKING INSTRUCTIONS

---

1. Clean and decontaminate items to insure the safety of the handler.
2. Complete and include the Cleaning Certificate.
3. Place the product in a plastic bag to keep out dirt and packing material.
4. Use a large carton, preferably the original, and surround the product completely with packing material.
5. Insure for the replacement value of the product.

## **Cleaning Certificate**

Organization \_\_\_\_\_

Department \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Country \_\_\_\_\_

Model No. of Device \_\_\_\_\_ Lot Number \_\_\_\_\_

Contaminant (if known) \_\_\_\_\_

Cleaning Agent(s) used \_\_\_\_\_

Radioactive Decontamination Certified?

(Answer only if there has been radioactive exposure)

\_\_\_ Yes \_\_\_ No

Cleaning Certified By \_\_\_\_\_

Name

Date



## APPENDIX A      REQUIRED NOTICE

---

The Federal Communications Commission defines this product as a computing device and requires the following notice:

This equipment generates and uses radio frequency energy and if not installed and used properly, may cause interference to radio and television reception. There is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- re-orient the receiving antenna
- relocate the YSI Instrument with respect to the receiver
- move the YSI Instrument away from the receiver
- plug the YSI Instrument into a different outlet so that the computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet, prepared by the Federal Communications Commission, helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 0004-000-00345-4.

**Note:** While testing to EN-61000-4-6, Conducted RF Immunity, per Table A.1 of EN61326, Electrical Equipment for Measurement, Control and Laboratory Use, the YSI 550A exhibited an ERROR 8 message from 8.6 MHz 22.8 MHz at induced RF voltages of 3-Volts to 1-Volt RMS on the 25-foot probe cable. If you observe this interference please relocate the probe-cable away from heavy industrial equipment power and control cables or communications equipment cables which may be causing the interference.

## APPENDIX B      ACCESSORIES REPLACEMENT PARTS

---

The following parts and accessories are available from YSI or any YSI Authorized Dealer.

| YSI Model Number | Description  |
|------------------|--|
| 559              | Replacement DO Module  |
| 5908             | 6 Cap Membranes and Electrolyte Solution                               |
| 5238             | Probe Reconditioning Kit (sanding tool and disks for cathode cleaning) |
| 5060             | Small Carrying Case, Soft (instrument & 4M cable)                      |
| 5080             | Small Carrying Case, Hard-Sided (instrument & 4M cable)                |
| 5081             | Large Carrying Case, Hard-Sided (instrument and 20M cable)             |
| 5065             | Form-Fitted Carrying Case  |
| 063507           | Tripod   |
| 614              | Ultra Clamp, C-Clamp Mount   |
| 5085             | Hands Free Harness   |

*Y S I incorporated*



1700/1725 Brannum Lane  
Yellow Springs, Ohio 45387 USA  
(800) 765-4974 (937) 767-7241  
FAX: (937) 767-1058  
Website: <http://www.ysi.com>  
E-mail: [environmental@ysi.com](mailto:environmental@ysi.com)

Item # 655830  
Drawing # 655830  
Revision A  
November 2003